Missouri Forest Pest Report 1991

Missouri Department of Conservation

Forestry Division

Missouri Forest Pest Report

Missouri Department of Conservation
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Introduction

Although Missouri was not described as having a drought during 1991, it was very dry through all of the growing season from April through November. Spring was rather wet, however, soil conditions became drier and remained dry until September.

Normal low temperatures were experienced in winter 1990-1991, therefore most plants flushed in spring normally. Winter burn was only very mild.

Spring brought wet weather and with it excellent conditions for infection by leaf disease fungi. Sycamore anthracnose and anthracnose of ash and dogwood was very evident statewide. Quince rust on hawthorn and applescab on crabapples were also severe in the early part of the growing season. Diplodia blight was common on Austrian pine and pine wilt nematode was responsible for widespread mortality of Scotch pine. Brown spot needle blight was evident on Scotch pine in many Christmas tree plantations around the state.

The European pine sawfly occured in large numbers on Scotch and mugho pines in north Missouri. The eastern tent caterpillar populations were low in 1991. The shingle oak skeletonizer made a reappearance after six years of absence. The green-stripped maple worm occurred in large numbers creating severe defoliation of silver maples in certain counties.

Populations of the walnut caterpillar in 1990, collapsed in 1991, while the fall webworm defoliation percentages were in the 50-80 percent range on persimmon, walnut and hickory in south Missouri.

Because of the drought and dry period of 1991 many trees continue to die in woodlands and in landscape plantings. Most of this mortality is attributed to drought stress and invasion of trees by secondary insects and disease. Oaks and hickories are the main species affected. Mortality due to periods of drought often appears two to three years past the drought event.

Requests for training in tree problem diagnosis and identification of tree problems continue to increase each year. Over 369 individuals in the tree care industry were trained in five pest management seminars this year.

We continued to place emphasis on the survey and detection of forest pests in 1991. Monitoring for gypsy moth, which continued with the assistance of the Missouri Department of Conservation, trapped 36 male moths in the state, compared to a total of eight moths in 1990. The results of this survey and our observations on trends in pest populations are provided in this report.

Conditions in Brief

Forest Insects

Eastern Tent Caterpillar - populations were light over the entire state occurring on eastern black cherry.

European Pine Sawfly - occurred in moderate to heavy numbers on Scotch and mugo pines this spring in scattered locations in northern Missouri.

Evergreen Bagworm - infestations were very numerous and defoliation caused serious shrub damage in some areas.

Green-stripped Mapleworm - caused severe defoliation of silver maple in selected counties in west and north Missouri.

Looper Complex - was at low levels of defoliation in 1991.

Miscellaneous Defoliators - such as the variable oak leaf caterpillar, walking stick, *Datana* caterpillars, yellow necked caterpillar and others appeared in large numbers.

Shingle Oak Skeletonizer - occurred on shingle oak in a band 200 miles wide extending from Platte County to the Bootheel.

Spider Mite - levels were unusually high on Scotch pine and spruce.

Forest Diseases

Apple Scab - prematurely defoliated susceptible crabapple cultivars by the end of July.

Diplodia Tip Blight - infection increased on Austrian pine this year. New shoot tip infections were common on pines in landscape plantings.

Dogwood Spot Anthracnose - occurred on flowering dogwoods as well as Septoria leaf spot and Botrytis infection.

Dutch Elm Disease - of American elm incidence was very high this year, killing trees in yards and along fence rows.

Fire Blight - infection of rose family hosts was comparable to previous year's disease levels.

Foliar Diseases - caused by fungal pathogens were common on a wide range of hardwood hosts. Leaf browning and premature defoliation were prevalent due to drought and the infections.

Oak Decline - (or drought stress) continues to kill oaks in both forest and landscape plantings but at reduced levels this year.

Oak Wilt- was active in several counties causing minimal mortality.
Quince Rust- caused serious branch tip dieback and fruit infection on hawthorn around the state.

The Program

In 1962, a cooperative program, the Forest Pest Control Program, was entered into with the U.S. Forest Service by the Forestry Division, Missouri Department of Conservation. Under the original agreement the effort is designed to detect, evaluate and control forest insects and diseases on state and private land. Department foresters and other personnel report occurrences of damaging insects and diseases. A forest entomologist and forest pathologist coordinate the program. In 1991, the title of the program was changed to Cooperative Forest Health Program.

Insects, diseases, drought and other predisposing factors can cause damage to trees and shrubs which may be unnoticed until mortality occurs. Tree losses occur on an annual basis in the forest from hardwood borers and defoliators, pine cambial feeders, root rot, canker and stem diseases, drought and overmaturity.

Trees under stress were vulnerable to attack by insect borers, and a host of canker fungi and root rot fungi. Some factors which stress trees are drought, compacted soil, root disturbance, lightning strikes, insufficient soil elements, and wet or dry soil conditions to list just a few. Maintaining tree vigor is the most important consideration to ensuring a long life.

Projects

The cooperative team effort of Department foresters and Forestry Division staff specialists resulted in a well coordinated, successful Forest Pest Management Program in 1991. Over 3,700 shade and forest tree requests were serviced statewide in 1991. The services of staff specialists were available to foresters and others. In February and May, five Tree Care Seminars were held in Kansas City, St. Joseph, Portageville, Jefferson City, and Springfield for foresters, Assistant Resource Foresters and personnel associated with the green industry. Over 369 people attended these five seminars.

Department foresters and staff specialists serviced over 3,300 pest related telephone calls. Over 1,500 diagnoses of tree problems were made for the state. Forest pest management specialists and district foresters presented technical sessions to arborists at regional technical seminars and conferences.

Gass conducted detection and evaluation surveys on major insect and disease problems in 1991 on 5,000,000 acres. Reports were prepared and submitted to the U.S. Forest Service.

Over 20 Plant Clinics were conducted in the St. Louis, Kansas City and Columbia areas to serve the public in assisting them with their tree and shrub questions. A total of five Forest Insect and Disease Status Reports (April through August) were prepared and sent to all Missouri Christmas Tree Producers, most Department personnel, and other individuals involved in tree care, totaling 1,750 copies per month. Gass and Luley attended the annual State Cooperators Meeting hosted by the U.S. Forest Service in St. Paul, Minnesota in March and Gass attended the 1991 American Phytopathological Society Conference in St. Louis, Missouri.

We completed our tenth season with the Integrated Pest Management Program (IPM) with the University of Missouri-Columbia. This multi-state reporting program has been developed to collect and computerize pest occurrence data for most economic plant pests in the state. Forestry Division is reporting results to the IPM Program for incidence of insects and disease on forest and ornamental trees.

Forest and Shade Tree Insects

Hardwood Defoliators

Aphids and Lace Bug - populations were moderate to heavy on hardwood foliage statewide in late summer. Mottled leaves and molding honeydew was evident on leaves causing concerns from the public. Infestation was noticeable on walnut, sycamore and buckeye, with leaves dropping prematurely.

Trend - populations should be light to moderate in 1992.

Suppression - individual owners had their trees sprayed by arborists.

Eastern Tent Caterpillar - populations were very light this spring where black cherry grows. Defoliation amounts ranged from one to two limbs per affected tree.

Trend - populations will be light to moderate in 1992.

Suppression - certain owners poked the webs from their ornamental plants.

Fall Webworm - populations were heavy over most of the state in 1990. Webbing on black walnut, pecan, hickory, persimmon and redbud were common. Also defoliated were fruit trees and other hardwood species.

Trend - populations should be heavy in 1992.

Suppression - various walnut and pecan growers sprayed their trees to control this insect.

Gall Insects - generated numerous reports statewide in 1991. Gall insects such as flies, wasps, psyllid gall insects and mites are active in

spring. These insects lay their eggs in succulent leaf or twig tissue where the swollen parts eventually develop. Galls commonly observed are on hackberry, hickory, pin oak, bur oak, hard maple and silver maple. Elm and walnut leaves also have galls in early summer. Woody stem galls are common on pin and shingle oak.

Trend - insect gall infestation is a part of nature. We will always have gall insect development with cyclical fluctuations. Galls will always be difficult to control.

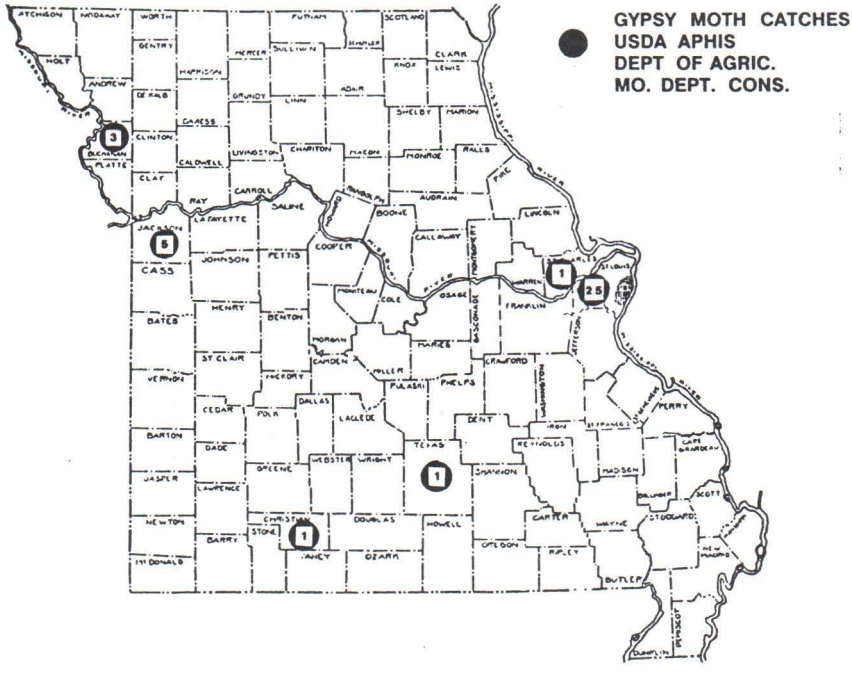
Suppression - no control was conducted for gall insects in 1991.

Green Stripped Maple Worm - was heavy on silver maple tree in west-central Missouri in 1991.

Trend - populations will remain heavy in 1992 and cause increased defoliation of silver maple.

Suppression - several tree owners attempted to control this insect using recommended chemicals, however success was poor in several instances.

Gypsy Moth - during the summer of 1991, the gypsy moth defoliated millions of acres of forest land in the northeastern United States and Michigan. Spot infestations still remain in several states while the infested range continued to grow in central Michigan.

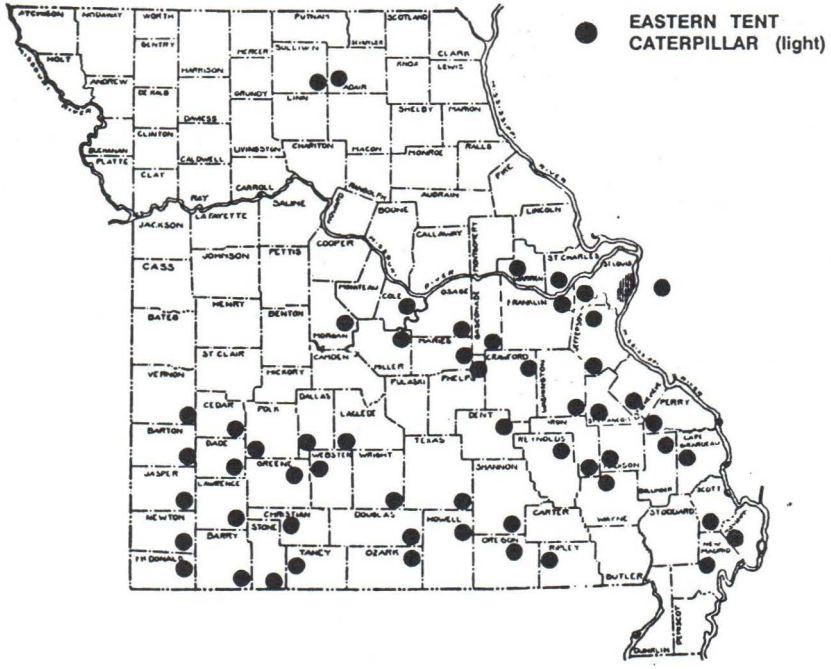


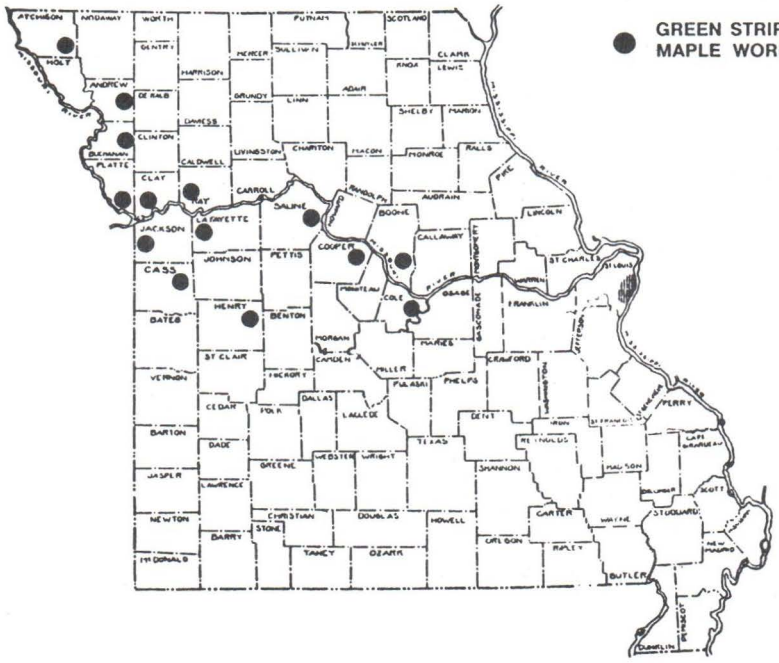
Personnel of the Missouri Department of Agriculture trapped thirty-six male moths in the state, twenty-five in the St. Louis area alone. To date, no spot infestations have been discovered in Missouri.

In 1991, 6,800 gypsy moth phermone traps were placed in 64 counties by U.S.D.A., A.P.H.I.S., P.P.Q. and personnel of the Missouri Department of Agriculture Plant Industry Division. The Missouri Department of Conservation funded five summer positions to locate and monitor traps in selected counties. Other cooperating groups were the Department of Natural Resources, State Parks and Historic Preservation, National Campers and Hikers Association, Corps of Engineers and John Grinstead at Ft. Leonard Wood, and U.S. Forest Service, Mark Twain National Forest.

The gypsy moth isn't native to the United States, however its life cycle closely parallel's that of a number of other native defoliators. Gypsy moth larvae feed in spring and early summer on a variety of hardwood foliage. With three repeated defoliations of hardwoods, tree mortality can occur. One defoliation can kill evergreen trees such as pine or cedar.

Looper Complex - defoliation was light over the state in 1991. The term, looper complex, is used to describe at least five different insects which emerge and feed on a variety of hardwood foliage at the same time of the year. Common loopers are the linden looper, elm spanworm, spring cankerworm, leaf roller and leaf tier. It may take two to three years for looper complex to build to a high level. Predators and





parasites usually are responsible for the collapse of large populations of the looper complex.

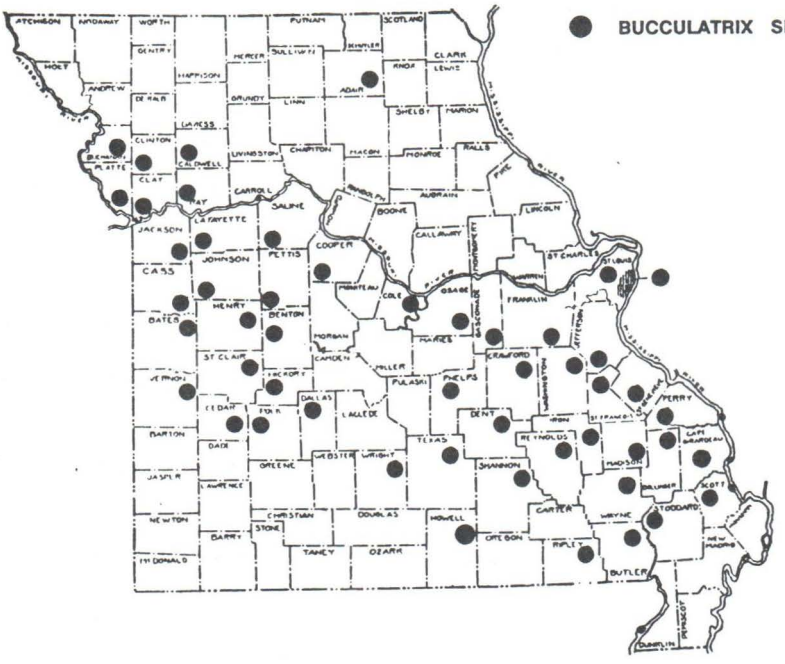
Trend - 1992 population levels should be low in most sections of the state.

Suppression - no suppression work was done in 1991.

Scale Insects - as a group infest a variety of hardwood trees throughout the state. These are more common on ornamental hardwoods such as pin oak, Euonymus, white oak and post oak. Some of the scales which were reported during 1991 were the Euonymus scale on Euonymus, tortise scale and pine needle scale on Scotch pine and Kermes scale on white oak. The most damaging scales are the obscure scale on pin oak.

Trend - scale insects will continue to cause decline on stressed hardwood trees. Scale populations will fluctuate on some trees species depending upon its life cycle.

Suppression - arborists use dormant oil, and an approved insecticide to control the crawler stage of the scale in spring.



Shingle Oak Skeletonizer - made its first appearance since 1985 causing skeletonizing of shingle oak tree leaves. In many areas of the state skeletonizing was 100 percent of all the foliage on all affected trees , while the appearance of the tree is reduced, no growth loss will be experienced.

Trend - we may not see this insect for another six years (1997).

Suppression - no suppression work was conducted.

True Tree Grasshopper - appeared in large numbers and caused extensive defoliation in several southeast Missouri Counties. Preferred hosts are flowering dogwood, red maple and white oak.

Trend - this insect will occur in low number in 1992.

Suppression - no suppression was conducted for this insect.

Variable Oak Leaf Caterpillar - populations were light and being reported from several counties during 1991. The variable oak leaf caterpillar has the capacity to defoliate thousands of acres of hardwood trees in late summer. A case in point is the heavy defoliation during 1969-1971.

Trend - populations could increase in 1992. Although defoliation does occur in late summer it does not affect the vigor of defoliated trees.

Suppression - no suppression work was conducted in 1991.

Yellownecked Caterpillar - populations were similar to those of 1990. This caterpillar feeds on pin oak and other hardwood species.

Trend - populations will increase slightly in 1992.

Suppression - few tree owners had their trees sprayed with an approved insecticide.

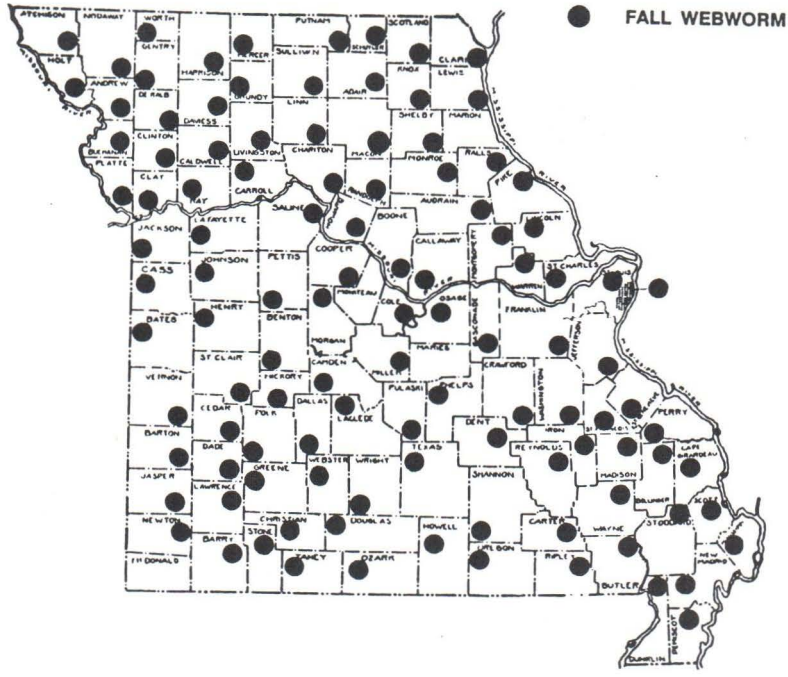
Hardwood Borers

Bronze Birch Borer - populations continue to infest stressed white birch over the state causing extensive mortality. The insect is attracted to white birch wherever it grows.

Trend - stressed white birch will continue to die as a result of the stress factor which is usually drought.

Suppression - a number of owners spray or have arborists spray their white birch trees. An effort is being made to acquaint nurserymen and landowners with our native river birch as a substitute for white birch.

The Carpenterworm and Red Oak Borer - and other living tree hardwood borers as part of our endemic, indigenous borer populations continue to infest hardwood trees in our forested and urban areas of the state. Hardwood borers are a major problem on many newly planted and smaller caliper sized hardwood trees in urban areas.



Trend - borer infestation will continue in hardwood trees occupying poor sites. Estimated dollar loss to the hardwood borer complex amount to $4,000,000 annually through lumber degrade and ornamental tree loss.

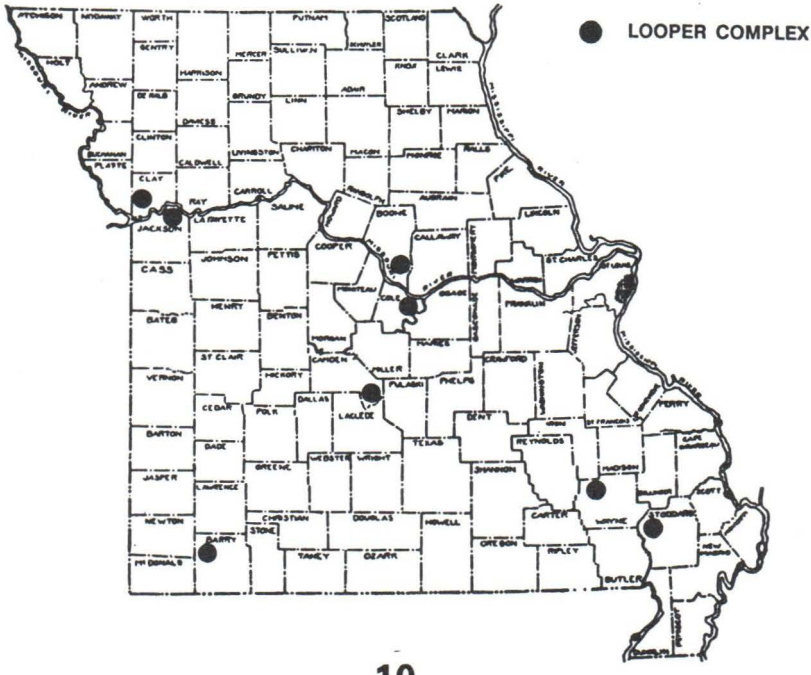
Suppression - selective tree harvest, sanitation harvest and stand conversion from low quality hardwood to shortleaf pine were conducted in forested areas over the state. Some shade tree owners controlled borer infestations on high value trees.

The Cottonwood Twig Borer, Cottonwood Borer, Cottonwood Leaf Beetle and Poplar Tent Maker - all pests of eastern cottonwood continue to infest cottonwood where it grows. Borer damage is greater in trees growing on sites not suited to growing cottonwood. Defoliation by the Poplar Tent Maker occurs also everywhere cottonwood grows.

Trend - no increase in infestation is expected in 1992.

Two-Lined Chestnut Borer - is a secondary attacking insect of stressed oak trees. It plays a role in killing trees along with various root rots. In 1980, 1983, 1984, 1989, and now in 1991 drought conditions prevailed from late June through September over most of the state. As a result of the affects of drought, many more oak trees were lost. Other stressing factors are late frosts, poor sites and spring defoliators.

Trend - drought periods alternate in cycles of ten to fifteen years. Trees presently dying were stressed in earlier years and are just now affected. Recent mortality is occurring as a result of recent weather conditions. Trees are continually dying in the forest as part of the



natural succession of a maturing forest. Drought when present, along with other factors will always play a role in tree mortality.

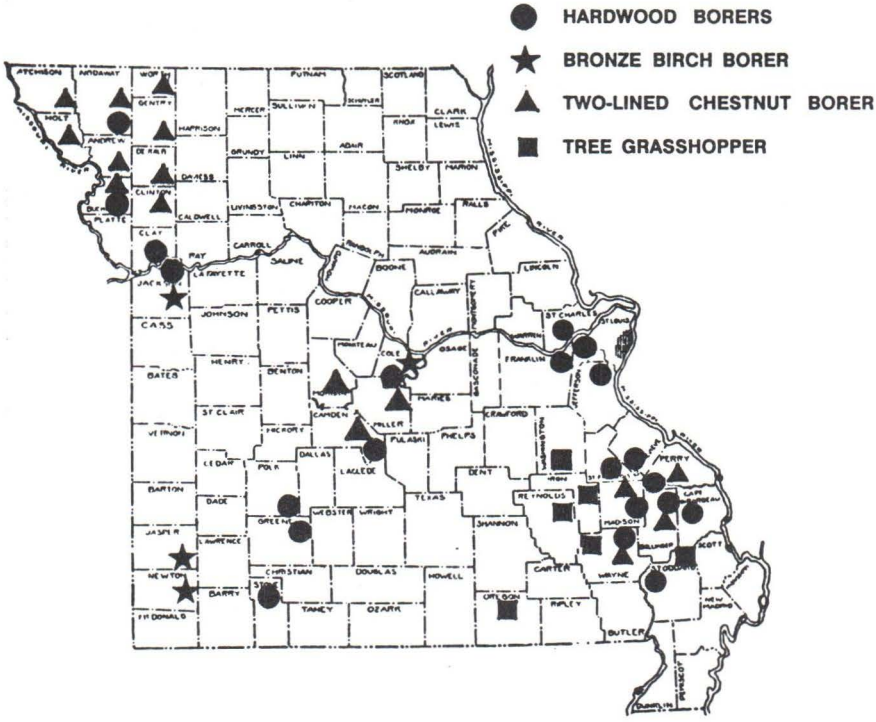
Suppression - drought hazard sites must be identified by the forester and managed in such a manner as to consider species composition. Where hardwood basal area is too low, alternatives such as even-aged management or pine conversion should be considered within the shortleaf pine range. On droughty, poorer hardwood sites the entomological and pathological rotation should be applied rather than a fixed rotation age.

Pine and Cedar Trunk Borer, Twig Borers and Defoliators

Black Turpentine Beetle - light infestations were reported in Bollinger, Iron, and Wayne Counties. The black turpentine beetle infests weakened shortleaf pine trees that were damaged during construction or in timber sales, wind thrown or those struck by lightning. Once the infestation has proceeded and is successful, the Ips beetle can also develop and complete the process of killing the tree.

Trend - beetle populations will develop where shortleaf pine trees are disturbed either naturally or artificially.

Suppression - where economically feasible, attacked trees are removed as timber cutting progresses in timber sale areas.



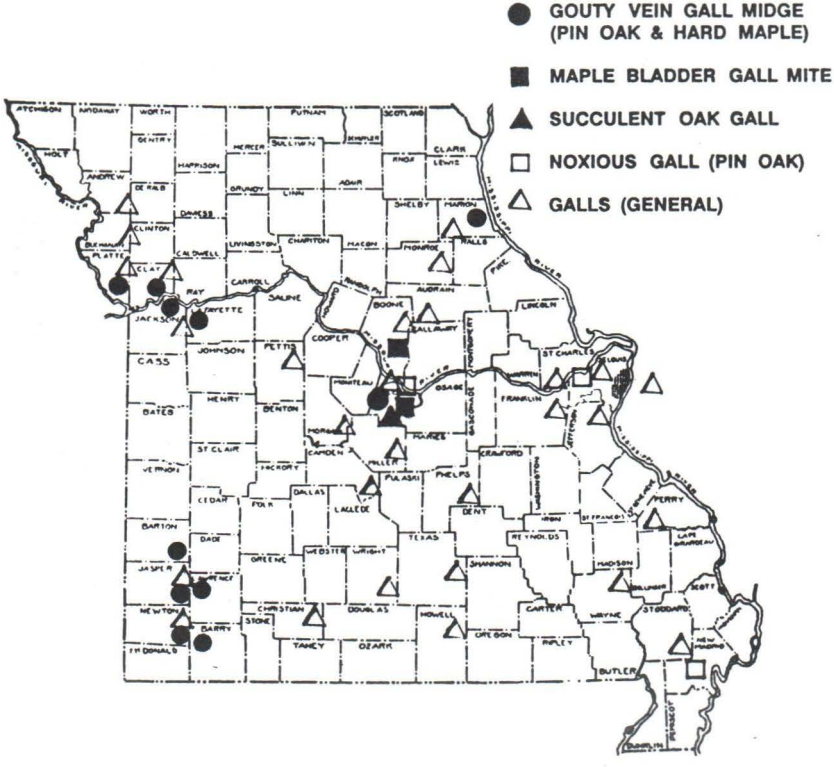
Ips Beetle - is a weak attacker of live, distressed shortleaf, jack, Virginia, Scotch and white pine trees. It is most usually detected on very stressed pines and pines that have infestations of black turpentine beetle. If new pine slash is created Ips often infests this slash and might later infest live, healthy neighboring pine trees. Ips was reported from nine counties although, very likely, pines in additional counties were infested. Ips has been infesting white, Austrian, and Scotch pines in the St. Louis and Kansas City areas.

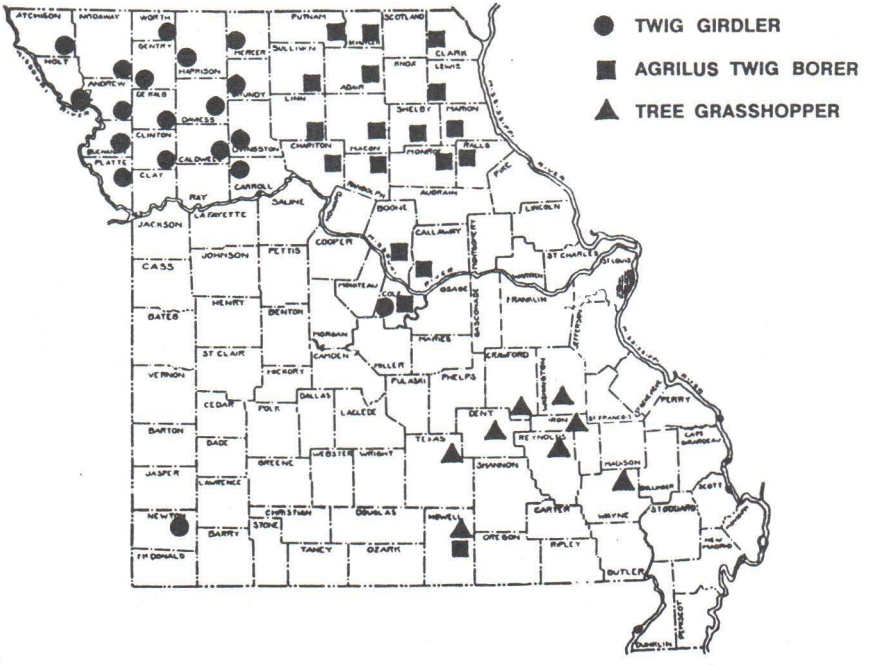
Evergreen Bagworm - infestations of bagworms were heavy on upright pfitzer junipers and eastern redcedar over the state in 1991. Frequent, complete defoliation can result in mortality in two years.

Trend - bagworms will continue to threaten unsprayed ornamental evergreens. Populations are expected to be moderate to heavy statewide in 1992.

Suppression - some owners of evergreens had their shrubs sprayed by tree service companies.

European Pine Sawfly - populations were moderate to heavy on Scotch and mugo pine plantings primarily in north Missouri but also occurring in south Missouri. Reports were submitted for 27 counties where heavy defoliation was observed. Affected trees are grown for Christmas trees and ornamental purposes. The larvae are late spring defoliators.





Trend - populations will be heavy in 1992.

Suppression - a number of Christmas tree producers and homeowners sprayed their plants where this insect appeared.

Loblolly Pine Sawfly - was reported in 1991 for Newton and Scott Counties.

Redheaded Pine Sawfly - populations were light to moderate in 1991 being reported from seven counties. Redheaded pine sawfly larvae feed on shortleaf and Scotch pines primarily in the sapling stage. There can be as many as three generations throughout the Missouri growing season.

Trend - populations will be moderate in 1992.

Suppression - several homeowners with ornamental pine sprayed their trees to control this insect.

Pales Weevil - populations were low in 1991. Infestations were reported from Adair County. Pales weevil adults feed on terminal and lateral twigs of Scotch pine. Feeding occurs after dark causing flagging of the infested trees. White pine can also be a host of Pales weevil.

Trend - populations should be low in 1992.

Suppression - very little suppression work was conducted during 1991. Our standard control recommendation is to spray stumps produced during the previous Christmas season with thiodan and

diesel fuel in March of the following year. Unless growers already have the problem, they usually do not take control measures to prevent possible weevil build-ups for the following year.

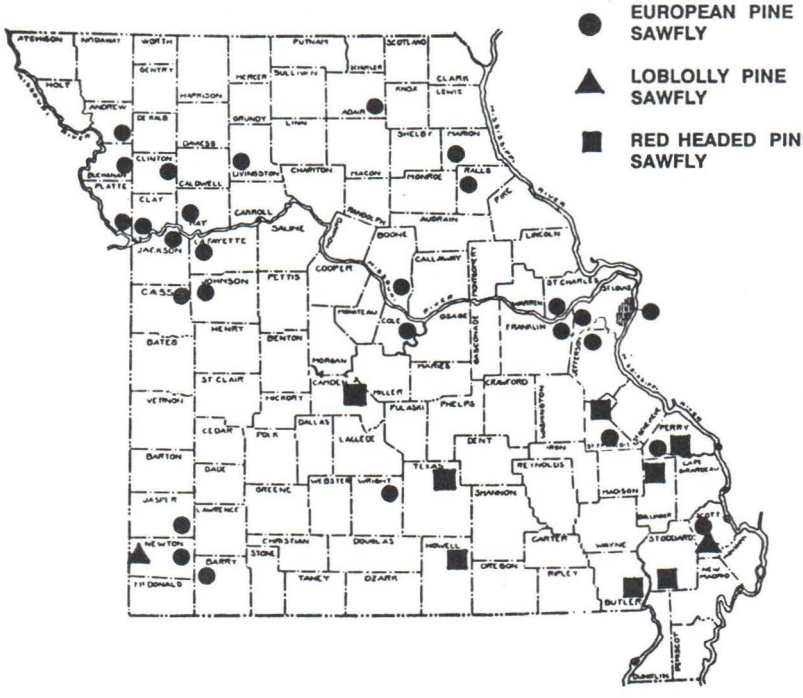
Pine Needle Scale - populations were moderate to heavy in scattered areas around the state on Scotch pine. In 1991, infestations were found in Livingston, Jackson, Boone, Montgomery, and Texas counties. The scale feeds on needles of Scotch and mugo pines. Scales can build on needles in such large numbers that the plant appears to be whitewashed.

Small infestations should be controlled before the populations grow too large and difficult to control. There is always a potential for spread to surrounding Scotch pine trees. Although the pine needle scale is difficult to control, superior dormant oil can be used any time of the year and Sevin or Dursban can be used to control the crawler stage synchronized with the blooming of lilac in spring.

Trend - populations will be moderate to heavy on selected plantations during 1992.

Suppression - several Christmas tree growers sprayed individuals and groups of trees to control the pine needle scale in 1991.

Pine Root Collar Weevil - populations were light, existing in two counties. Pine root collar weevil damage resembles rodent girdling at



the base of the tree. The difference, however, is found in the girdled portion where heavy resin accumulation is present as well as the presence of the weevil larva or larvae.

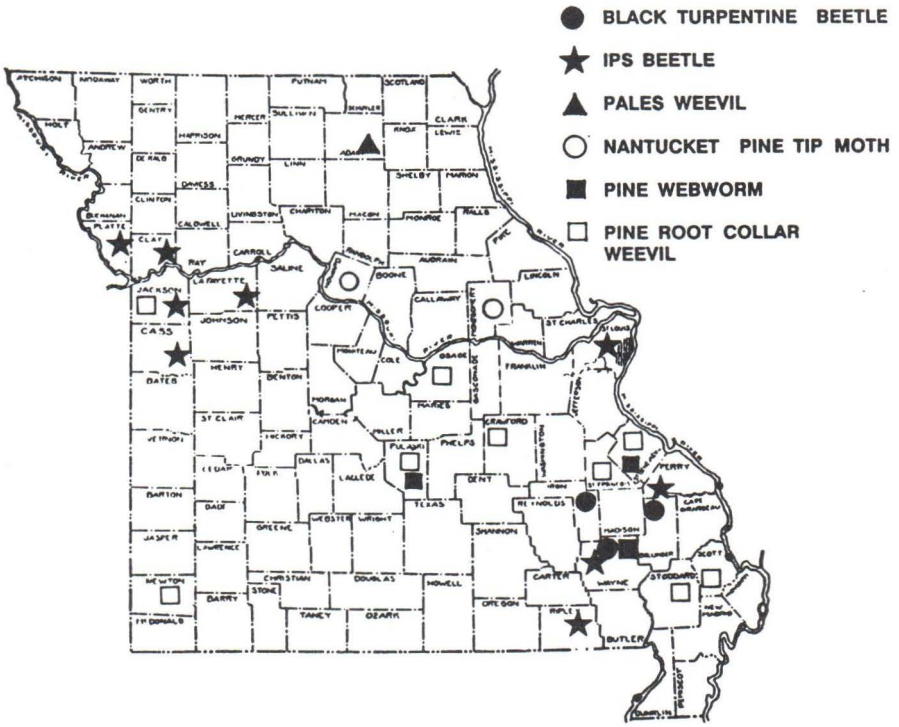
Since this is the first observation of this insect in Missouri, it is well to know its damage characteristics and control. The spraying of liberal amounts of lindane or naled around the bases of potential host trees in mid-May and late July, early August will control adults emerging after overwintering and control this year's new adults respectively.

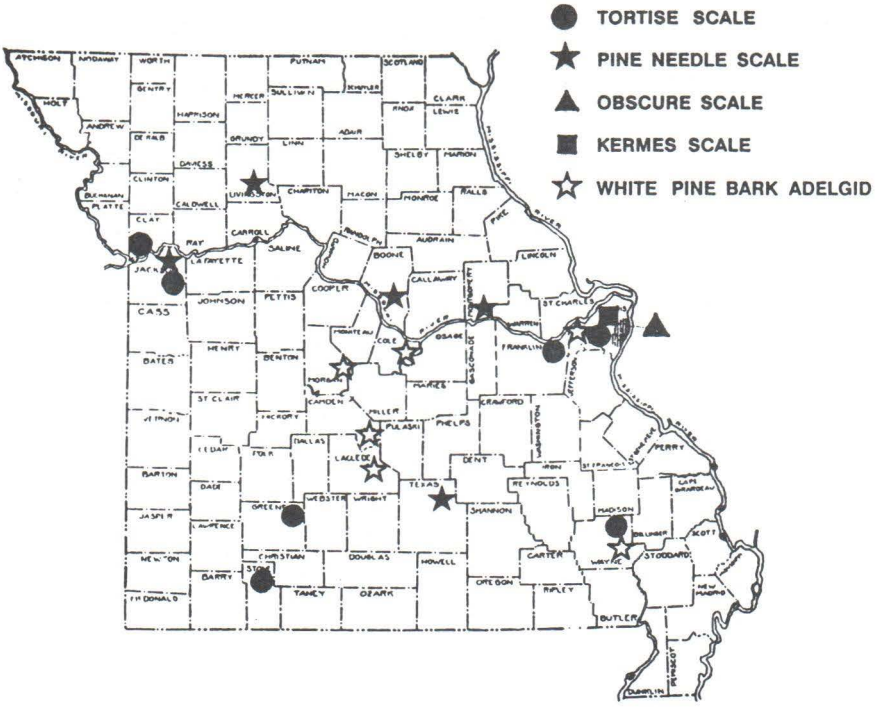
If a tree is damaged by the pine root collar weevil or rodents, the tree will take on a light green appearance in the early stages, then turn brown. The tree can be easily shaken while it still is standing.

Trend - populations might build in 1992 in selected plantations.

Suppression - owners did no suppression work except for sanitation removal of the infested trees. Directions as listed above are recommended for controlling the pine root collar weevil.

Pine Webworm - populations were light to moderate in 1991. The pine webworm adult is a moth. The larvae feed on needles of shortleaf and Scotch pines creating a packed mud-like cluster on the terminal or lateral branches. Defoliation occurs mostly on smaller pine trees which retards growth and causes an unsightly tree. Infestations occurred in Wayne, Pulaski and Ste. Genevieve Counties.





Trend - populations will be light to moderate on scattered trees in 1992.

Suppression - certain Christmas tree producers will spray their trees with an approved insecticide.

Pine Tortise Scale - infested Scotch pine Christmas trees in plantations in seven counties in 1991. This insect is gradually becoming an important pest on Scotch pine. Control is difficult when an infestation has become established on five or more trees. Often, predaceous insects play an important role in controlling scale populations. Usually only trees five feet and taller are attacked.

An infestation can be detected by the presence of honeydew which has molded, imparting a gray or black cast to the infested portion of the tree.

Trend - populations should be light to moderate in 1992.

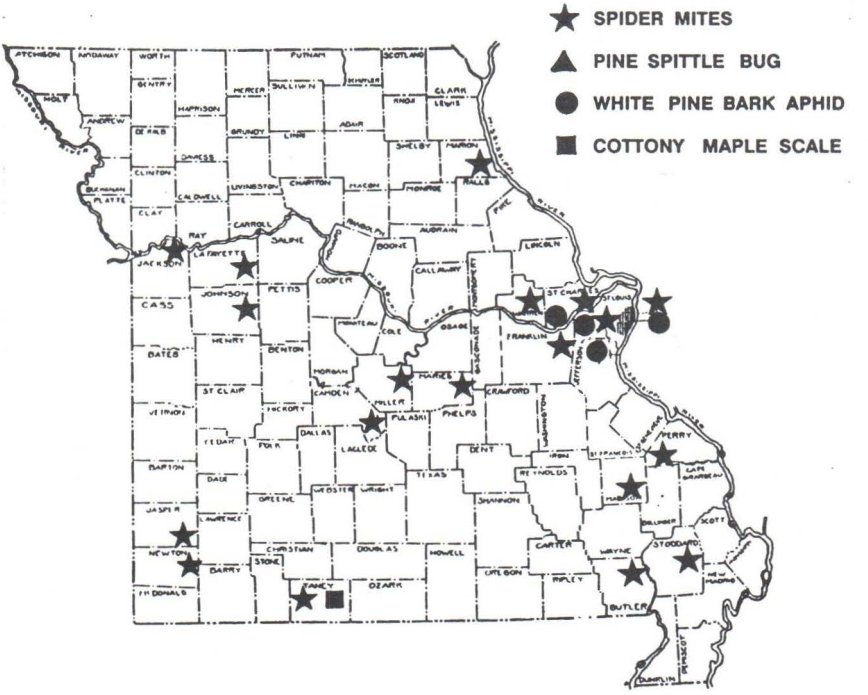
Suppression - Christmas tree producers were advised to spray dormant oil on only those trees infested prior to winter. If needed, growers will spray their infested trees in late May of 1992 with Sevin or Malathion to control the crawler stage of the scale.

Spider Mites - are normally a nuisance on various tree species in summer. Infestation was moderate to heavy over the state in 1991. Reports of damage were received in scattered counties around the state. There is no question that spider mites occurred in every county

in the state. Spider mites can be especially damaging to Scotch pine, baldcypress, Norway spruce, white pine, and Colorado and white spruce. Conditions were favorable for development of spider mite populations. Feeding by spider mites produces a light-green, mottled color to infested needles. Upon closer examination, eggs, egg cases, webbing of adults can be observed on infested plant material.

Trend - populations should be moderate on plants scattered over the state in 1992. Although feeding seldom directly kills trees, it does stress them, thus damaging the aesthetic value of Christmas trees and ornamental plants.

Suppression - arborists use miticides to control the various species of spider mites. Christmas tree growers spray their Scotch pine trees for spider mites as the problem develops.



Forest and Shade Tree Diseases

Conifer Diseases

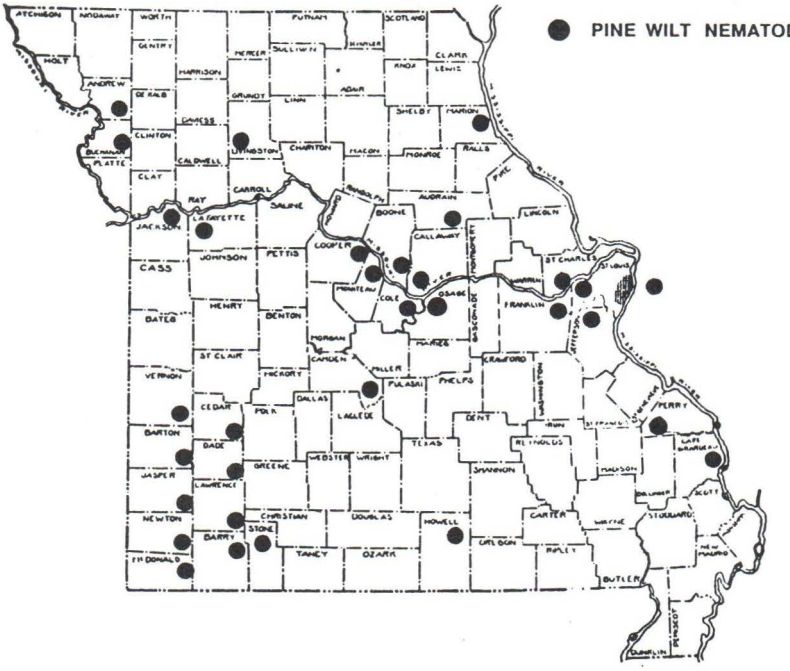
Brown Spot Needle Blight - continued to be the major disease of Scotch pine grown for Christmas trees. Although summer was very dry, April and May were wet which provided excellent conditions for brown spot infection in 1991. Ornamental Scotch pines are not seriously affected by the disease.

Trend - infection in 1992 is expected to parallel that of 1991.

Suppression - most Christmas tree producers apply chlorothalonil when needles are 1/2 full elongation and again at full needle expansion. Use of longer needled varieties of Scotch pine, particularly the Belgium variety, will greatly reduce brown spot problems.

Diplodia Tip Blight - increased in 1991 due to a wet spring and aging Austrian pines. Infection by the fungus Sphaeropsis sapinea occurs during periods of wet weather and bud expansion and shoot elongation of pines. Damage becomes evident as the fungus moves into older branch tissues and branch dieback occurs.

Trend - levels of Diplodia blight are tied to weather conditions during bud expansion and shoot elongation. The fungus is widely distributed and causes significant damage to older Austrian pines.



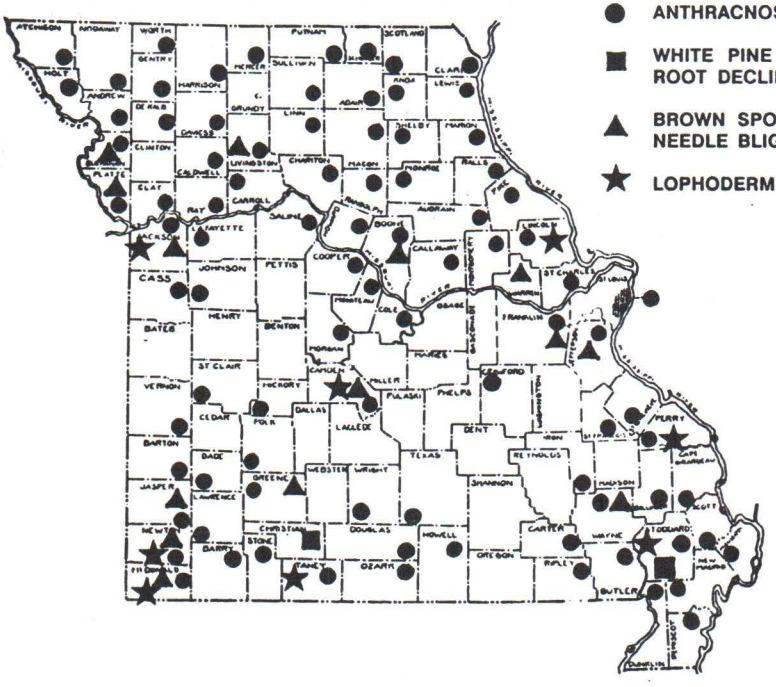
Suppression - fungicide applications made during bud break and shoot expansion will control the disease.

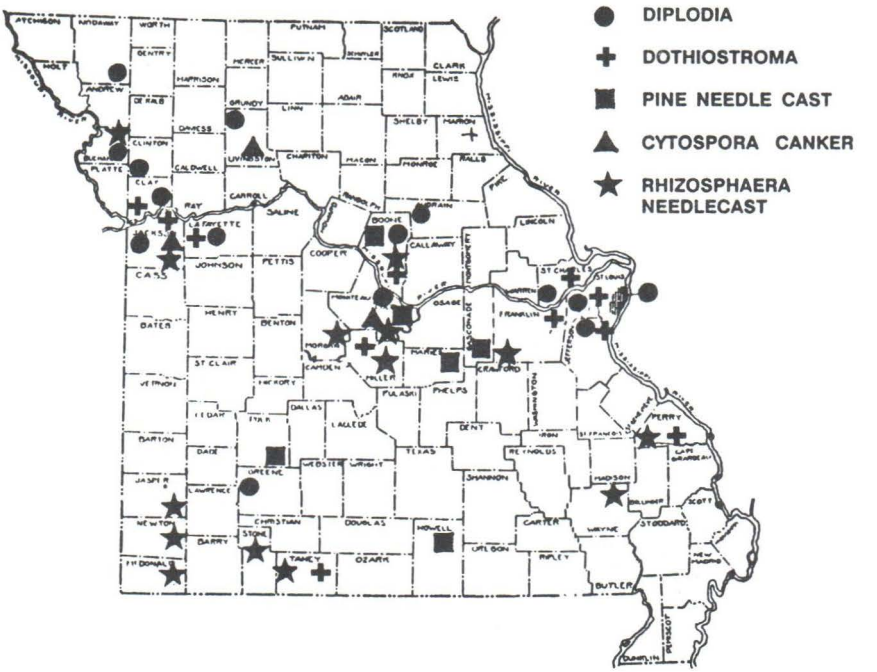
Pine Wilt Nematode - Scotch pine reached epidemic proportions in 1991. Dry conditions and increased beetle vector population size has been responsible for the large increase in beetle and nematode killed trees. Infested trees die suddenly. Twigs are dry when broken and stumps lack resin exudation. Mortality existed in each county of the state.

Trend - pine wilt nematode will continue as beetle populations remain at present levels or increase in 1992.

Suppression - sanitation is the only known control. Remove dead tree or trees and burn all parts of the tree prior to March 25 or sooner. There is no known chemical control for the beetle or systemic control for the nematode.

White Pine Problems - around the state in 1991, white pine foliage began turning brown or tips of needles turned a rusty brown. Tree owners from around the state started to phone because they were concerned about their white pine trees. We eventually determined that because weather conditions were so adverse to healthy white pine growth and Missouri soils are not particularly favorable to white pine growth, a complex set of problems were occurring. These problems were covered in the August, 1991 Insect and Disease Status Report.





For the annual record however we will review what happened to some of the white pine trees. We have to remember that white pine is very genetically variable; each tree is a different individual and responds differently to its environment such as soil conditions, moisture availability, air temperature and general treatment. Secondly white pine is one of the more sensitive trees to air pollution. Scientists plant white pine in plots in predetermined areas to determine if and what air pollutants might be present.

So in 1991, one of the first problems we saw was damage from O_3 causing tip burning and called post emergence tip burn. O_3 or ozone is caused in nature by lightning. We did have lightning storms in abundance in spring and early summer. Lightly affected trees recover from this damage. Where all needles are affected on a tree, mortality can occur. Another problem detected was deficiency in soil moisture, where all needles turned brown and trees died. A soil fungus is responsible for a condition called white pine root decline. Here to the needles droop and turn a straw yellow. Sometimes a tree will tip on its side for lack of root support. There is always the mystery tree with no explanation for dying.

Some hints for caring for newly planted white pine include watering generously for one hour, once a week. Do not drown the tree. Mulch the new tree at least 1 1/2 feet in radius from the trunk and at least four inches deep. Prior to planting, purchase white pine three feet tall or less. Smaller trees adapt better to transplant shock than larger trees. Finally inspect trees for insect or disease pests periodically. If a problem is developing, spray or control by handpicking.

Hardwood Diseases

Cedar-Apple and Cedar-hawthorn Rust - infection was especially heavy in 1991 causing leaf loss as well as infection of fruit and causing thickening of twigs resulting in twig dieback. The hawthorn ornamentals were especially hard hit over the state.

Trend - as conditions continue, infection will be heavy again in 1992.

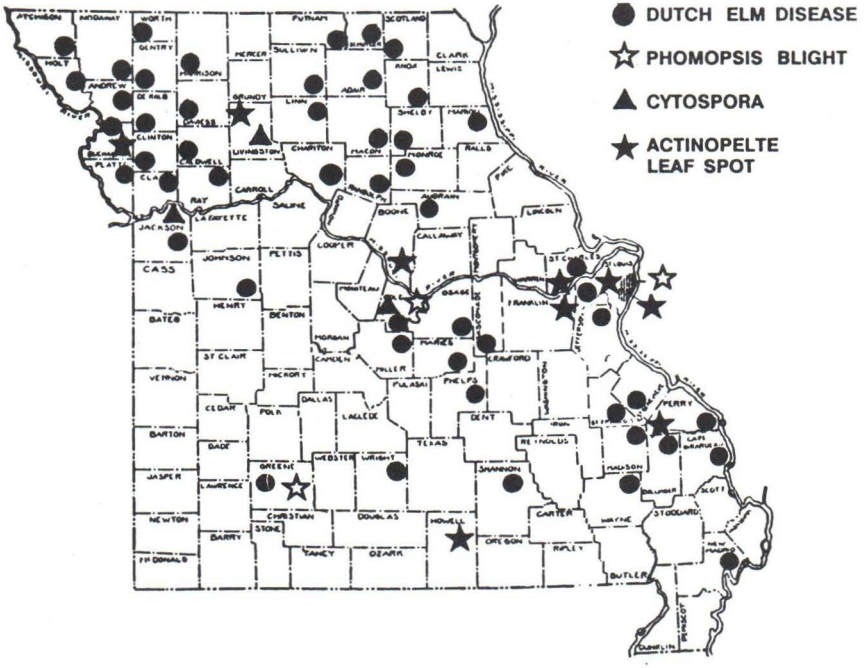
Suppression - few ornamental owners had their shrubs sprayed with a fungicide for this rust fungus.

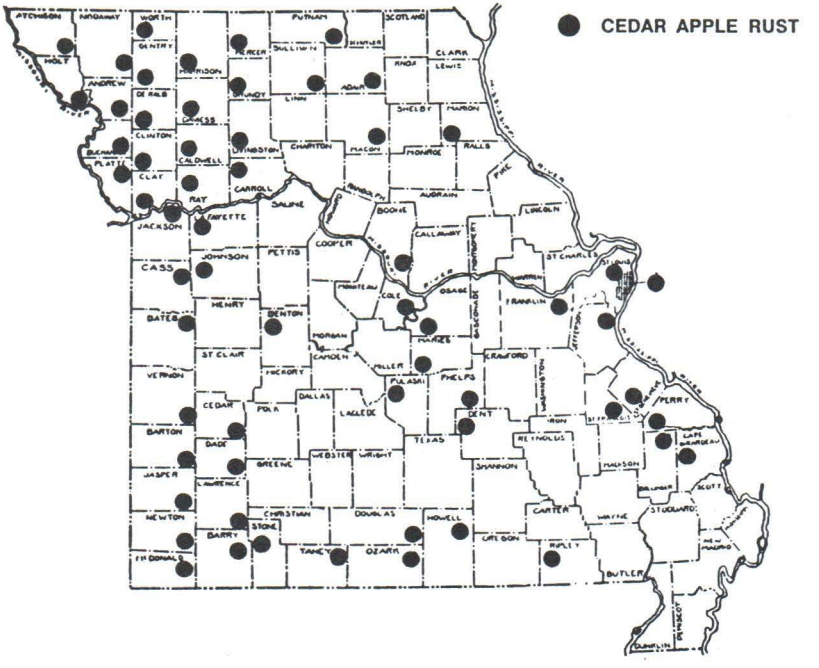
Dutch Elm Disease - increased at an accelerated pace in 1991. Elms in general suffered because of the dry warm weather. Beetle populations were high to carry the Dutch elm disease fungus to live trees.

Trend - as long as conditions favorable for transmission of the beetle and fungus are present, mortality will continue of the American elm.

Suppression - dead American elm trees were removed by home owners.

Oak Mortality - predisposed by drought conditions followed by attacks from the two-lined chestnut borer and root rot infection continued through 1991. Because of the very dry summer of 1991 new trees began to show signs of dying. Where management plans are active, droughty areas should be examined frequently to detect mortality and follow-up with a dead oak harvest.





Trend - oaks will continue to die in the forest as a response to drought and as part of a maturing forest.

Suppression - salvage cuts were made on stands with severe oak mortality. Management guidelines to identify high risk stands are being developed.

Oak Wilt - continued at endemic levels in 1991 and caused most losses on large, valuable ornamental trees in urban areas. The oak wilt fungus is vectored by a very small oak bark beetle. Infection can spread from one tree to a neighbor through root grafts.

Trend - no dramatic increase in oak wilt is expected in future years.

Suppression - severing root grafts, removing affected trees, and avoiding wounding oaks in the spring and early summer were recommended for oak wilt reduction.

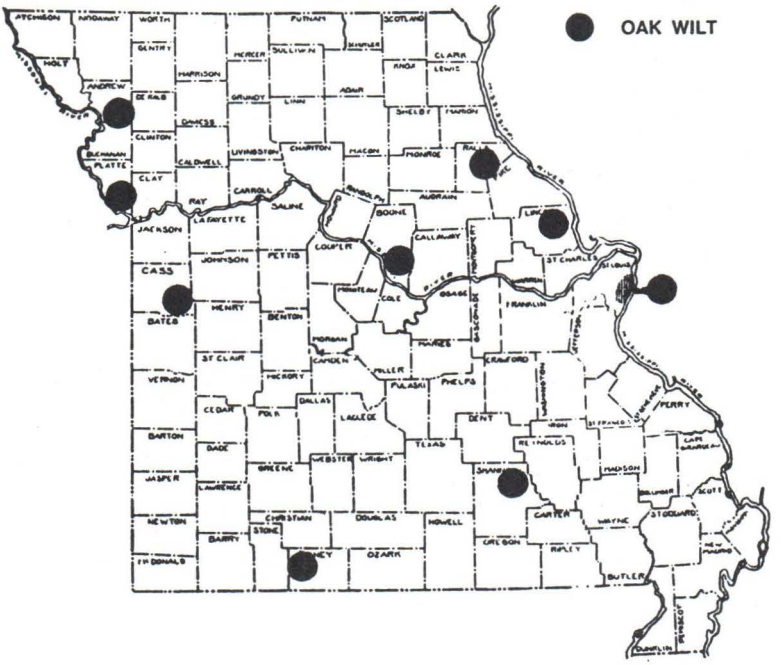
Conclusion

Growing conditions were poor since near drought levels prevailed during the active season. Insect populations were evident causing increased Dutch elm disease and pine wilt nematode, both of which have insect vectors. Leaf fungi and insect defoliators were very common. We continued to see oak mortality caused by previous years drought and 1991 drought. Fall webworm populations were very high in 1991.

We continued to actively survey for established insects and diseases this year. The Department provided support for the gypsy moth trapping program which has closely monitored the status of gypsy moth introductions. A total of 36 male moths were trapped in 1991.

There is heightened awareness of the importance and health of our forest and shade trees. Occasional outbreaks of pests such as insect defoliators, and the presence of dead and dying trees due to drought stress and overmaturity cause much concern to the public about the health of the forest ecosystem. A federal program, known as Forest Health Monitoring, may be implemented in the future in an attempt to monitor the long term health of our forests and to standardize annual pest surveys. The project will begin when federal funding becomes available.

We have been able to collect and assemble the statewide report on pest incidence and impact with the help of monthly reports provided by each Forestry District. Our Foresters cooperation with pest reporting, and interaction and help with pest problems on the District level has made this a successful program.



Insect-Host

Agrilus Twig Borer *Agrilus sp.* on white oak

Northeast

Bagworm *Thyridopteryx ephemeraeformis* (Haw.) on assorted evergreens and certain hardwoods

Statewide

Baldcypress Gall *Taxodiomyia cypressiananassa* (Osten Sacken)

Cape Girardeau

Black Turpentine Beetle *Dendroctonus terebrans* (Oliv.) on Shortleaf pine

Bollinger, Iron, and Wayne

Borers, Carpenterworm, red oak borer, *Goes sp.* on Hardwood

Bollinger, Buchanan, Camden, Cape Girardeau, Clay, Cole, Franklin, Greene, Jackson, Jefferson, Madison, Nodaway, Perry, Polk, St. Charles, St. Francois, Ste. Genevieve, St. Louis, Stoddard and Stone

Bronze Birch Borer *Agrilus anxius* (Gory) on White Birch

Statewide

Catalpa sphinx *Ceratomia catalpae* (Boisduval) on Catalpa

Cole, Greene, Stone

Cottonwood Borer *Plectrodera scalator* (F.)

Statewide

Cottonwood Leaf Beetle *Chrysomela scripta* (F.)

Statewide

Cottonwood Twig Borer *Gypsonomia haimbachiana* (Kft.)

Statewide

Two-Lined Chestnut Borer *Agrilus bilineatus* (Web.) on Oaks

Statewide

Twig Girdler *Oncideres cingulata* (Say) on Hickory and persimmon and others

Statewide

Eastern Tent Caterpillar *Malacosoma americanum* (F.) on eastern black cherry

Statewide

Elm Leaf Beetle *Pyrrhalta luteola* (Müller) on Siberian Elm

Statewide

European Pine Sawfly *Neodiprion sertifer* (Geoff) on Scotch and mugo pines

Adair, Andrew, Barry, Boone, Buchanan, Cass, Clay, Clinton, Cole, Franklin, Jackson, Jasper, Jefferson, Johnson, Lafayette, Livingston, Marion, Newton, Perry, Platte, Ralls, Ray, Scott, St. Charles, St. Francois, St. Louis, St. Louis City, Wright

Fall Webworm *Hyphantria cunea* (Drury) on black walnut, pecan, persimmon, hickory and assorted other hardwood species

Statewide

Gall Insects on various hardwoods

Statewide

Green Stripped Maple Worm *Dryocampa rubicunda* (F.) on silver maple

Andrew, Boone, Buchanan, Cass, Clay, Cole, Cooper, Henry, Jackson, Lafayette, Platte, Ray, Saline

Gypsy Moth (in traps) 25 in St. Louis County and one in St. Charles County, five in Jackson County, three in Buchanan County, one in Christian County and one in Texas County immediately south of Ft. Leonard Wood.

Hackberry Butterfly *Asterocampa celtis* (B. & L.) on hackberry

Andrew, Buchanan, Clinton, DeKalb, Jackson

Ips pini (Say) on shortleaf and other pines

Cass, Clay, Jackson, Lafayette, Perry, Platte, Ripley, Wayne

Looper Complex on Hardwoods

Statewide

Maple Bladder Gall Mite *Vasates quadripedes* (Shimer) on silver maple

Statewide

Nantucket Pine Tip Moth *Rhyaiconia frustrana* (Comst.) on shortleaf and Scotch pine

Crawford, Newton, Osage, Pulaski, Scott, St. Francois, Ste. Genevieve, Stoddard

Oak Timberworm *Arrhenodes minutus* (Drury) in white oak

Barry

Obscure Scale *Melanaspis obscura* (Comst.) on pin oak

Cole, St. Louis City

Pales Weevil *Hylobius pales* (Herbst) on Scotch pine

Adair

Pine Needle Scale *Phenacaspis pinifoliae* (Fitch) on Scotch pine

Boone, Jackson, Livingston, Montgomery, Texas

Pine Tortise Scale *Toumeyella numismatica* (P. & McD.) on Scotch pine

Clay, Franklin, Greene, Jackson, Stone, St. Louis, and Wayne

Pine Webworm *Tetralopha robustella* (Zeller) on Scotch and shortleaf pines

Pulaski, Ste. Genevieve, and Wayne

Poplar Tent Maker *Ichthyura inclusa* (Haldeman)

Statewide

Redheaded Pine Sawfly *Neodiprion lecontei* (Fitch) on shortleaf and Scotch pines

Bollinger, Butler, Camden, Howell, Perry, and St. Francois

Redhump Anal Caterpillar *Symmerista canicosta* (Franclemont) on oak

Jackson

Spider Mites *Oligonychus spp. and Tetranychus spp.* on miscellaneous species

Statewide

Variable Oak Leaf Caterpillar *Heterocampa manteo* (Doubleday) on oaks

Jackson

Walking stock *Diapheromera femorata* (Say) on oaks

Statewide

Walnut Caterpillar *Datana integerrima* (G.&P.) on walnut

Stone

Woolly Alder Aphid *Prociphilus tessellatus* (Fitch) on maple

St. Louis

Disease and Host

Air Pollution Ozone (White Pine)

Statewide

Armillaria Root Rot *Armillaria mellea* (Vahl. Fr.) Karst. on Oak

Stone

Brown Spot Needle Blight *Scirrhia acicola* (Dearn) Siggers on Scotch Pine

Boone, Buchanan, Camden, Franklin, Greene, Jackson, Jasper, Jefferson, Livingston, McDonald, Newton, Platte, Warren, Wayne

Cedar Apple Rust *Gymnosporangium juniperi-virginianae* Schw. on Apple, Eastern Redcedar

Statewide

Cedar-Quince Rust *Gymnosporangium clavipes* (Cooke & Peck) on Statewide

Cytospora Canker *Cytospora kunzei* Sacc. on Blue Spruce, Norway Spruce

Cole, Jackson, Livingston, St. Louis

Diplodia Tip Blight *Sphaeropsis sapinea* (Fr.) Dyke & Sutton on Austrian, Scotch, Mugo, Ponderosa and Red Pine

Audrain, Boone, Buchanan, Clay, Clinton, Cole, Greene, Jackson, Jefferson, Lafayette, Livingston, Nodaway, St. Charles, St. Louis, St. Louis City

Dothistroma Needle Blight *Dothistroma pini* Hul. on Austrian and Ponderosa Pine

Boone, Clay, Franklin, Jackson, Jefferson, Lafayette, Marion, Miller, Perry, St. Charles, St. Louis, and Taney

Dutch Elm Disease *Ophiostoma ulmi* (Buism.) Nannf. on American Elm

Statewide

Eastern Gall Rust *Cronartium quercum* (Berck.) Miyabe ex. Shirai f. sp. sconatae on Shortleaf pine

Dent, Iron, Reynolds, Shannon, Wayne

Fusarium Canker *Fusarium solani* (Mart.) Appel & Wallenw. Emend Synd. & Hans. on Black Walnut

Atchison

Maple Anthracnose *Aureobasidium apocryptum* (Ell. & Ev.) Herm-Nijh. on Sugar Maple

Statewide

Oak Anthracnose *Gnomonia quercina* Kleb. on Black, Red, Scarlet and White oaks

Statewide

Oak Leaf Blister *Taphrina caerulescens* (Desmaz. & Mont.) Tul. on Red oak, pin oak

Statewide

Oak Wilt *Ceratocystis fagacearum* (Bretz) Hunt on Black oak, Red oak, and Pin oak

Andrew, Boone, Cass, Lincoln, Platte, Ralls, Shannon, St. Louis, and Taney

Pine Needle Rust *Coleosporium asterum* (Diet.) Syd. on Shortleaf pine

Boone, Cole, Gasconade, Howell, Maries, Polk

Pine Wilt Nematode *Bursaphalenchus xylophilus* (Steiner and Burher) Nickle on Scotch pine

Statewide

Rhizosphaera Needlecast *Rhizosphaera kalkhoffi* Bub. on Blue Spruce

Boone, Buchanan, Cole, Franklin, Jackson, Jasper, Miller, Morgan, McDonald, Newton, Perry, Stone, Taney, Wayne

Sycamore anthracnose *Discula platani* (Peck) Sacc. on American Sycamore

Statewide

Walnut Anthracnose *Gnomonia leptostyla* (Fr.) Ces. & Den. on Black Walnut

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